Complete Summary

GUIDELINE TITLE

Prevention of bloodstream infections. In: Prevention and control of healthcare-associated infections in Massachusetts.

BIBLIOGRAPHIC SOURCE(S)

Prevention of bloodstream infections. In: Betsy Lehman Center for Patient Safety and Medical Error Reduction, JSI Research and Training Institute, Inc. Prevention and control of healthcare-associated infections in Massachusetts. Part 1: final recommendations of the Expert Panel. Boston (MA): Massachusetts Department of Public Health; 2008 Jan 31. p. 69-82.

GUIDELINE STATUS

This is the current release of the guideline.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Bloodstream infections

GUIDELINE CATEGORY

Prevention

CLINICAL SPECIALTY

Infectious Diseases
Internal Medicine

Pediatrics
Preventive Medicine

INTENDED USERS

Advanced Practice Nurses
Hospitals
Nurses
Physician Assistants
Physicians

GUIDELINE OBJECTIVE(S)

- To provide evidence-based recommendations for a statewide infection control and prevention program to improve health outcomes by reducing the risk of acquiring and transmitting healthcare-associated infections
- To provide recommendations for prevention of bloodstream infections

TARGET POPULATION

Adults and children with intravascular catheters at risk of bloodstream infections

INTERVENTIONS AND PRACTICES CONSIDERED

1. Healthcare worker education and training
2. Monitoring catheter sites visually or by palpation
3. Hand hygiene
4. Maintaining aseptic techniques during catheter insertion
5. Proper catheter site care using antiseptics and dressings
6. Proper selection and replacement of intravascular catheters
7. Proper replacement of administration sets, needleless systems, and parenteral fluids
8. Care of pressure monitoring systems
9. Care of umbilical catheters

MAJOR OUTCOMES CONSIDERED

Incidence of healthcare-associated infections

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The Expert Panel was divided into six task groups. In order to generate sound, evidence-based recommendations, a comprehensive reference library was created for each task group comprising articles, publications, and other materials relevant to their work. An expert in library science, aided by a JSI Research and Training Institute, Inc. (JSI) staff member with experience in literature review, conducted literature searches, selected articles for inclusion, and managed and organized the task group libraries. For the purpose of the project, JSI gathered an extensive body of literature (over 2000 published articles). Starting with the reference library of a local healthcare associated infections (HAI) expert, it was supplemented and updated to include the most current articles and expanded on recommendations made by Expert Panel and task group members. Figure 1 in the original guideline document summarizes the literature review process.

Literature searches were conducted in PubMed using applicable Medical Subject Headings (MeSH) and key words. Refer to Figure 2 in the original guideline document for information on literature search methodology.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Level of Evidence Ranking

Level I: Strong evidence from at least one well-designed randomized controlled trial

Level II: Evidence from well-designed non-randomized trials; cohort or case-controlled analytic studies (preferably from >1 center); multiple time-series studies

Level III: Well-designed descriptive studies from more than one center or research group

Level IV: Opinions of authorities (e.g., guidelines), clinical evidence; reports of expert committees

Level V: No quality studies found and no clear guidance from expert committees, authorities or other sources

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

To aid the task groups and Expert Panel in their decisions, JSI Research and Training Institute, Inc. (JSI) generated qualitative summaries and reviews of relevant literature, outlining the current "state of the science" on task group-indicated topics of debate. All selected studies were critically assessed for internal validity or methodological rigor and only those with high quality of evidence grades were considered in generating evidence-based recommendations.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Consensus Development Conference)
Expert Consensus (Delphi)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The 2006 Health Care Reform Law directed the Massachusetts Department of Public Health (MDPH) to establish a comprehensive state wide infection prevention and control program. To direct this new effort, a healthcare-associated infection (HAI) Expert Panel was convened in November 2006 under the auspices of the Betsy Lehman Center for Patient Safety and Medical Error Reduction and MDPH. This multidisciplinary panel of experts included infectious disease specialists, epidemiologists, infection control and hospital quality professionals, consumers, professional organizations, and hospital executives and clinical leaders. Research, coordination and facilitation of the work of the Expert Panel and the associated Task Groups was provided by JSI Research and Training Institute, a public health research and consulting firm located in Boston.

The mission of the Expert Panel was to provide guidance on all aspects of a statewide infection control and prevention program, review the key elements of such a program, and submit their completed recommendations to the Betsy Lehman Center and the Massachusetts Department of Public Health by January 31, 2008.

The Expert Panel held twelve monthly meetings beginning on November 30, 2006. Due to the multi-faceted nature of the Panel's charge, six Task Groups were formed in order to focus the efforts of Panel members on their respective areas of expertise.

1. Bloodstream and Surgical Site Infections (BSI, SSI)--Prevention, Surveillance, and Reporting
2. Optimal Infection Control Program Components
3. Ventilator-Associated Pneumonia (VAP)--Prevention, Surveillance, and Reporting
4. Methicillin-Resistant *Staphylococcus aureus* (MRSA) and Other Selected Pathogens--Prevention, Surveillance, and Reporting
5. Public Reporting and Communication
6. Pediatric Affinity Group--Prevention, Surveillance, and Reporting

Panel members were asked to join at least one group, aligning with their expertise and interest. Additionally, group membership was supplemented with experts and stakeholders from outside the Expert Panel. Each task group was led by an Expert Panel member (Task Group Leader) who facilitated the calls and assisted in the literature review process. Task groups held one-hour-long conference calls every three weeks. A JSI coordinator supported each task group by reviewing and summarizing the literature and aiding in drafting recommendations. Coordinators were also responsible for all administrative work including minute taking, distribution of materials, and communication between the Expert Panel and task groups.

Due to time and capacity limitations, catheter-associated urinary tract infections (CAUTI) were not a specific task group topic. However, the product of a parallel process of evidence review and guideline updating, by experts representing the Infectious Disease Society of America (IDSA) and the Society for Healthcare Epidemiology of America (SHEA), was graciously made available to our project. An ad hoc committee of Expert Panel members and outside experts studied and endorsed these prevention guidelines and they have been incorporated into this final report.

Expert Panel recommendations, in addition to being scientifically sound, needed to take into account the current practices of infection control programs in Massachusetts. For this purpose, JSI surveyed infection control program directors across the Commonwealth in the areas of prevention, surveillance, reporting, and education relating to HAIs. The comprehensive survey questionnaire was developed using a review of current literature, expert reports, and existing surveys. After receiving input and approval from the Expert Panel and the Harvard Pilgrim Health Care Institutional Review Board, the survey was piloted in six hospitals. Once final revisions were made, the survey was mailed to the infection control program of all 71 acute care (non-Veterans Administration) hospitals in Massachusetts. A follow-up phone interview was also conducted to solicit more qualitative information and clarify any answers on the written survey. The completed survey responses were analyzed and results were distributed to project members to aid in their decision-making.

Taking into consideration both the results of the survey and the evidence, task groups drafted recommendations in the areas of HAI prevention and reporting. When voting, either during meetings or electronically, task group members had the opportunity to make comments and suggest additional changes. JSI then tallied the task group votes, reviewed comments, and brought back any major points of contention to the task group.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Strength of Recommendation Ranking

Category A: Strongly recommended

Category B: Recommended for implementation

Category C: Consider for implementation

Category D: Recommended against implementation

Category UI: Unresolved issue

No recommendation: Unresolved issue. Practices for which insufficient evidence or no consensus regarding efficacy exists.

COST ANALYSIS

The annual economic burden of healthcare-associated infections (HAI) in Massachusetts ranges from approximately $200 million to well over $400 million. While it is difficult to determine a precise estimate, it is clear that these infections are costly. Mandatory reporting of institutional-level HAI is a potential tool for improvement of quality of care and a method to be used by consumers, insurers, or providers to make decisions regarding where to seek or fund healthcare. If HAI are reduced with mandatory reporting, societal cost-savings should be anticipated. However, the effect of mandatory reporting on HAI rates is yet unknown. Additionally, increased costs to the hospitals and the Department of Public Health (DPH) should be anticipated. The methods used in this report should be beneficial to other state DPH. With limited resources and the potential benefits of public reporting yet to be established, there is a need to carefully balance the additional burden of reporting with current prevention efforts in order to obtain the optimum outcome, less infections.

Refer to *Prevention and Control of Healthcare-Associated Infections in Massachusetts, Part 2: Findings from Complementary Research Activities* (see the "Availability of Companion Documents" field) for more information on cost-analysis.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Once recommendations were approved by the task group members, they were presented to the Expert Panel for consideration and any necessary final revisions.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Note from the Massachusetts Department of Public Health (MDPH) and the National Guideline Clearinghouse (NGC):

- In addition to their own Levels of Evidence and Strength of Recommendation grades, the Task Force has included the original Strength of Recommendation grades from the Centers for Disease Control and Prevention (CDC). For definitions of those grades, please see the CDC Web site.

- *Prevention and Control of Healthcare-Associated Infections in Massachusetts* guideline has been divided into individual summaries. In addition to the current summary, the following are available:
    - Hand hygiene recommendations
    - Standard precautions in hospitals
    - Contact precautions in hospitals
    - Environmental measures for the prevention and management of multi-drug resistant organisms
    - Prevention of ventilator associated pneumonia
    - Prevention of surgical site infections
    - Prevention of catheter-associated urinary tract infections

Level of evidence ranking (I – V) and strength of recommendation ranking (A – D, Unresolved issue [UI], No recommendation) definitions are presented at the end of "Major Recommendations" field.

Recommendations for Placement of Intravascular Catheters in Adults and Children

Healthcare Worker Education and Training

1. Educate health-care workers regarding the indications for intravascular catheter use, proper procedures for the insertion and maintenance of intravascular catheters, and appropriate infection control measures to prevent intravascular catheter-related infections. *(CDC category IA)* ***A-IV***
2. Formally assess knowledge of and adherence to guidelines periodically for all persons who insert and manage intravascular catheters. *(CDC category IA)* ***A-IV***
    - 2-P**. Develop, update and disseminate institutional policies and procedures regarding the safe use of intravascular catheters that address all relevant patient populations and clinical settings. ***A-II******

3. Ensure adequate staffing levels of consistent and appropriately-educated health care workers in intensive care units (ICUs) to minimize the incidence of catheter-associated bloodstream infections (CABSIs). *(CDC category IB)* ***A-IV*** *

Surveillance

4. Monitor the catheter sites visually or by palpation through the intact dressing on a regular basis, depending on the clinical situation of individual patients. If patients have tenderness at the insertion site, fever without obvious source, or other manifestations suggesting local or BSI, the dressing should be removed to allow thorough examination of the site. *(CDC category IB)* ***A-IV***
    - 4-P**. In *addition to the above*: In pediatrics, the frequency of catheter site monitoring should be consistent with institutional policies, but at a minimum of every nursing shift. ***A-IV******

5. Encourage patients to report to their health-care provider any changes in their catheter site or any new discomfort. *(CDC category II)* ***A-IV***
6. Record the operator, date, and time of catheter insertion and removal, and dressing changes on a standardized form. *(CDC category II)* ***A-IV***

7. Do not routinely culture catheter tips. *(CDC category IA)* ***A-IV***

Hand Hygiene

8. Observe proper hand-hygiene procedures either by washing hands with conventional antiseptic-containing soap and water or with waterless alcohol-based gels or foams. Observe hand hygiene before and after palpating catheter insertion sites, as well as before and after inserting, replacing, accessing, repairing, or dressing an intravascular catheter. Palpation of the insertion site should not be performed after the application of antiseptic, unless aseptic technique is maintained. *(CDC category IA)* ***A-IV***
9. Use of gloves does not obviate the need for hand hygiene. *(CDC category IA)* ***A-IV***

Aseptic Technique during Catheter Insertion and Care

10. Maintain aseptic technique for the insertion and care of intravascular catheters. *(CDC category IA)* ***A-IV***
11. Wearing clean gloves rather than sterile gloves is acceptable for the insertion of peripheral intravascular catheters if the access site is not touched after the application of skin antiseptics. Wear sterile gloves for the insertion of arterial and central catheters. *(CDC category IA)* ***A-IV***
12. Wear clean exam gloves when removing vascular access dressings. Wear sterile gloves when manipulating the insertion site of any arterial or central venous vascular access device and for applying sterile dressings to any arterial or central venous vascular access device insertion site. *(CDC category IC)* ***A-IV***

Catheter Insertion

13. Do not routinely use arterial or venous cutdown procedures as a method to insert catheters. *(CDC category IA)* ***A-IV***

Catheter Site Care

14. Use a chlorhexidine-based antiseptic for skin preparation prior to insertion of any vascular access device in patients over 2 months of age. ***B-I*** Povidone iodine can be used for patients with known or suspected contraindications (i.e., allergy, hypersensitivity) to chlorhexidine unless other contraindication exists. ***B-IV*** (Mimoz et al., 1996; Parienti et al., 2004; Chaiyakunapruk et al., 2002; Humar et al., 2000)
    - 14-P**. The U.S. Food and Drug Administration (FDA) has not approved the use of chlorhexidine in infants aged less than 2 months and there is limited safety data for this population. Consequently, no recommendation can be made for the use of chlorhexidine in this population. ***UI*** (Parienti et al., 2004; Chaiyakunapruk et al., 2002; Humar et al., 2000; Andersen et al., 2005; Garland et al., 1996; Garland et al., 1995; Lund et al., 2001)

15. Prep skin surfaces with appropriate agent(s) according to manufacturer's guidelines and allow agent(s) to remain on skin until dry. *(CDC category IB)* ***B-IV***
16. Do not apply organic solvents (e.g., acetone and ether) to the skin before insertion of catheters or during dressing changes. *(CDC category IA)* ***A-IV***

Catheter-Site Dressing Regimens

17. Use either sterile gauze or sterile, transparent, semipermeable dressing to cover the catheter site. *(CDC category IA)* ***B-IV*** (Gillies et al., 2003)
18. The utility of dressings for tunneled central venous catheter (CVC) sites that are well healed is an unresolved issue. *(CDC category II)* ***UI***
    - 18-P**. Dressings will most likely be needed for all tunneled CVC sites in children, including those that are well-healed. ***B-IV****

19. Gauze dressings that prevent visualization of the insertion site should be changed routinely every 48 hours on central sites and immediately if the integrity of the dressing is compromised. Gauze used in conjunction with a transparent semipermeable membrane (TSM) dressing should be considered a gauze dressing and changed every 48 hours. If the patient is diaphoretic, or if the site is bleeding or oozing, a gauze dressing is preferable to a transparent, semipermeable dressing. *(CDC category II)* ***B-IV*** (Infusion Nurses Society, 2006)
20. Replace catheter-site dressing if the dressing becomes damp, loosened, or visibly soiled. *(CDC category IB)* ***B-IV***
21. For central vascular access devices, the optimal time interval for changing TSM dressings is dependent on the dressing material, age and condition of the patient, infection rate reported by the organization, environmental conditions, and manufacturer's labeled uses and directions; TSM dressing should be changed at least weekly. *(CDC category II)* ***B-IV*** (Infusion Nurses Society, 2006)
22. Do not use topical antibiotic ointment or creams on insertion sites (except when using dialysis catheters) because of their potential to promote fungal infections and antimicrobial resistance. *(CDC category IA)* ***B-IV***
23. Do not submerge the catheter under water. Showering should be permitted if precautions can be taken to reduce the likelihood of introducing organisms into the catheter (e.g., if the catheter and connecting device are protected with an impermeable cover during the shower). Patients with permanent catheters that traverse the skin should avoid swimming. *(CDC category II)* ***B-IV*** (Robbins et al., 1999)
    - 23-P**. For infants and toddlers, the catheter hub should be kept away from the diaper area and any stoma or gastrostomy site. ***B-IV****

Selection and Replacement of Intravascular Catheters

24. Select the catheter, insertion technique, and insertion site with the lowest risk for complications (infectious and noninfectious) for the anticipated type and duration of intravenous (IV) therapy. *(CDC category IA)* ***A-IV***
25. Promptly remove any intravascular catheter that is no longer essential. *(CDC category IA)* ***A-IV***

26. Do not routinely replace central venous or arterial catheters solely for the purposes of reducing the incidence of infection. *(CDC category IB)* ***A-IV***
27. Replace peripheral venous catheters at least every 72 to 96 hours in adults to prevent phlebitis. Leave peripheral venous catheters in place in children until IV therapy is completed, unless complications (e.g., phlebitis and infiltration) occur. *(CDC category IB)* ***A-IV***
28. When adherence to aseptic technique cannot be ensured (i.e., when catheters are inserted during a medical emergency), replace all catheters as soon as possible and after no longer than 48 hours. *(CDC category II)* ***A-IV***
    - 28-P**. When adherence to aseptic technique cannot be ensured (i.e., when catheters are inserted during a medical emergency), *consider* replacing all catheters as soon as possible within 48 hours. Given the difficulties of vascular access in infants and toddlers, this may not be possible in all cases. ***B-IV*** ***

29. Do not remove CVCs on the basis of fever alone. Use clinical judgment regarding the appropriateness of removing the catheter if infection is evidenced elsewhere or if a noninfectious cause of fever is suspected. In most cases of CVC-associated bacteremia or fungemia, the CVC should be removed. *(CDC category II)* ***B-IV*** (Mermel et al., 2001)
30. Do not use guidewire techniques to replace catheters in patients suspected of having catheter-related infection. *(CDC category IB)* ***A-IV***

Replacement of Administration Sets, Needleless Systems, and Parenteral Fluids

Administration Sets

(Administration sets include the area from the spike of tubing entering the fluid container to the hub of the vascular access device. However, a short extension tube might be connected to the catheter and might be considered a portion of the catheter to facilitate aseptic technique when changing administration sets).

31. Replace administration sets, including secondary sets and add-on devices, no more frequently than at 72-hour intervals, unless catheter-related infection is suspected or documented. *(CDC category IA)* ***A-IV***
32. Replace tubing used to administer lipid emulsions (those combined with amino acids and glucose in a 3-in-1 admixture or infused separately) within 24 hours of initiating the infusion. *(CDC category IB)*

    If the solution contains only dextrose and amino acids, the administration set does not need to be replaced more frequently than every 72 hours. *(CDC category II)*

    Administration sets and add-on filters that are used for blood and blood components shall be changed within 4 hours. ***B-IV***

33. Replace tubing used to administer lipid-based medication formulations such as propofol every 6 to 12 hours or according to manufacturer's recommendations. *(CDC category IA)* ***A-IV***

- 33-P**. In pediatrics, propofol should be used with caution and according to institutional policies; the product has age restrictions for certain indications. ***UI****

Needleless Intravascular Devices

34. Change the needleless components at least as frequently as the administration set. *(CDC category II)* ***B-IV***
35. Change caps no more frequently than every 72 hours or according to manufacturer's recommendations. *(CDC category II)* ***B-IV***
36. Ensure that all components of the system are compatible to minimize leaks and breaks in the system. *(CDC category II)* ***A-IV***
37. Minimize contamination risk by wiping the access port with an appropriate antiseptic and accessing the port only with sterile devices. *(CDC category IB)* ***B-IV*** (Menyhay & Maki, 2006)
38. Complete the infusion of lipid-containing solutions (e.g., 3-in-1 solutions) within 24 hours of hanging the solution. *(CDC category IB)* ***A-IV***
39. Complete the infusion of lipid emulsions alone within 12 hours of hanging the emulsion. If volume considerations require more time, the infusion should be completed within 24 hours. *(CDC category IB)* ***A-IV***
40. Complete infusions of blood or other blood products within 4 hours of hanging the blood. *(CDC category II)* ***A-IV***
41. No recommendation can be made for the hang time of other parenteral fluids. *(CDC category UI)* ***UI***

IV Injection Ports

42. Clean injection ports with 70% alcohol or an iodophor before accessing the system. *(CDC category IA)* ***A-IV***
43. Cap all stopcocks when not in use. Replace with new sterile caps after each use. *(CDC category IB)* ***A-IV*** (Infusion Nurses Society, 2006)

In Line Filters

44. Do not use filters routinely for infection-control purposes. *(CDC category IA)* ***A-IV***

IV-Therapy Personnel

45. Designate trained personnel who demonstrate competency for the insertion and maintenance of intravascular catheters. *(CDC category IA)* ***A-IV***

Prophylactic Antimicrobials

46. Do not administer intranasal or systemic antimicrobial prophylaxis routinely before insertion or during use of an intravascular catheter to prevent catheter colonization or BSI. *(CDC category IA)* ***B-IV***

Peripheral Venous Catheters, Including Midline Catheters in Adults and Children

Selection of Peripheral Catheter

47. Select catheters on the basis of the intended purpose and duration of use, known complications (e.g., phlebitis and infiltration), and experience of individual catheter operators. *(CDC category IB)* ***B-IV***
48. Avoid the use of steel needles for the administration of fluids and medication that might cause tissue necrosis if extravasation occurs. *(CDC category IA)* ***B-IV***
49. Use a midline catheter or peripherally inserted central catheter (PICC) when the duration of IV therapy will likely exceed 6 days. *(CDC category IB)* ***B-IV***
    - 49-P**. *Consider* a midline catheter or PICC when the duration of IV therapy will likely exceed 6 days. ***B-IV******

Selection of Peripheral-Catheter Insertion Site

50. In adults, use an upper- instead of a lower-extremity site for catheter insertion. Replace a catheter inserted in a lower-extremity site to an upper extremity site as soon as possible. *(CDC category IA)* ***A-IV***
51. In pediatric patients, the hand, external jugular vein, antecubital space, dorsum of the foot, or the scalp can be used as catheter insertion sites. *(CDC category II)* ***B-IV******
52. Evaluate the catheter insertion site daily, by palpation through the dressing to discern tenderness and by inspection if a transparent dressing is in use. Gauze and opaque dressings should not be removed if the patient has no clinical signs of infection. If the patient has local tenderness or other signs of possible catheter-associated bloodstream infection (CABSI), an opaque dressing should be removed and the site inspected visually. *(CDC category II)* ***A-IV***
    - 52-P**. In pediatrics, evaluate the catheter insertion site per institutional policies, with a minimum frequency of every nursing shift. ***A-IV******

53. Remove peripheral venous catheters if the patient develops signs of phlebitis (e.g., warmth, tenderness, erythema, and palpable venous cord), infection, or a malfunctioning catheter. *(CDC category IB)* ***A-IV***
54. In adults, replace short, peripheral venous catheters at least 72 to 96 hours to reduce the risk for phlebitis. If sites for venous access are limited and no evidence of phlebitis or infection is present, peripheral venous catheters can be left in place for longer periods, although the patient and the insertion sites should be closely monitored. *(CDC category IB)* ***A-IV***
55. Do not routinely replace midline catheters to reduce the risk for infection. *(CDC category IB)* ***A-IV***
56. In pediatric patients, assess each day whether there is a continued clinical indication for the peripheral venous catheter; remove promptly when no longer needed. Peripheral venous catheters can be left in place until IV therapy is completed, unless a complication (e.g., phlebitis and infiltration) occurs. *(CDC category IB)* ***A-IV***

Catheter and Catheter-Site Care

57. Do not routinely apply prophylactic topical antimicrobial or antiseptic ointment or cream to the insertion site of peripheral venous catheters. *(CDC category IA)* ***A-IV***

Central Venous Catheters, Including PICCs, Hemodialysis, and Pulmonary Artery Catheters in Adults and Children

General Principles

58. Use a CVC with the minimum number of ports or lumens essential for the management of the patient. *(CDC category IB)* ***A-IV***
59. A. Institutions should institute a comprehensive strategy that include the following components: hand hygiene, educating persons who insert and maintain catheters, use of maximal sterile barrier precautions, and a 2% chlorhexidine preparation for skin antisepsis during CVC insertion (if appropriate for age), avoidance of femoral site in adults, and daily assessment of the need for the catheter. ***A-II*** (Pronovost et al., 2006; Hu et al., 2004; Young, Commiskey, & Wilson, 2006; Frankel et al., 2005; Berenholtz et al., 2004; Institute for Healthcare Improvement, 2007)
    B. Institutions who want to further reduce central line infections should consider other new technologies such as antimicrobial impregnated catheters, and antiseptic dressings. ***A-I*** (Garland et al., 2001; Madeo et al., 1998; Levy et al., 2005; Leon et al., 2004; Walder, Pittet, & Tramer, 2002; Dunser et al., 2005; Jaeger et al., 2005; Rupp et al., 2005; Hanna et al., 2003; McConnell, Gubbins, & Anaissie, 2003; Hanna et al., 2004; Ho & Litton, 2006; Carratala et al., 1999)
    60. No recommendation can be made for the use of impregnated catheters in children. *(CDC category UI)* ***UI***
    61. Designate personnel who have been trained and exhibit competency in the insertion of catheters to supervise trainees who perform catheter insertion. *(CDC category IA)* ***A-IV***
    62. Use totally implantable access devices or cuffed devices for patients who require long-term, intermittent vascular access. For patients requiring frequent or continuous access, a PICC or tunneled CVC is preferable. *(CDC category II)* It should be noted that in the inpatient setting the risk of infection with PICCs is comparable to that of other non-cuffed CVCs. ***B-IV*** (Safdar & Maki, 2005)
    63. Use a cuffed CVC for dialysis if the period of temporary access is anticipated to be prolonged (e.g., >3 weeks). *(CDC category IB)* ***B-IV***
    64. Use a fistula or graft instead of a CVC for permanent access for dialysis. *(CDC category IB)* ***A-IV***
    65. Do not use hemodialysis catheters for blood drawing or applications other than hemodialysis except during dialysis or under emergency circumstances. *(CDC category II)* ***A-IV***
    66. Use povidone-iodine antiseptic ointment at the hemodialysis catheter exit site after catheter insertion and at the end of each dialysis session only if this ointment does not interact with the material of the hemodialysis catheter per manufacturer's recommendation. *(CDC category II)* ***A-IV***

Selection of Catheter Insertion Site

67. Weigh the risk and benefits of placing a device at a recommended site to reduce infectious complications against the risk for mechanical complications (e.g., pneumothorax, subclavian artery puncture, subclavian vein laceration, subclavian vein stenosis, hemothorax, thrombosis, air embolism, and catheter misplacement). *(CDC category IA)* ***A-IV***
68. Use a subclavian site (rather than a jugular or a femoral site) in adult patients to minimize infection risk for nontunneled CVC placement. *(CDC category IA)* In adult patients the use of the femoral site for CVCs should be avoided except when emergency circumstances or lack of vascular access precludes the use of other sites. When a femoral catheter is placed emergently, it should be electively replaced as quickly as possible. ***A-II*** (Hamilton & Foxcroft, 2008; Deshpande et al., 2005; Lorente et al., 2004; Lorente et al., 2005)
    - 68-P**. In pediatrics, the subclavian, internal jugular, femoral and antecubital sites are acceptable for nontunneled CVC placement. The saphenous vein can be used in non-ambulatory patients and PICC lines can be placed in the temporal and posterior auricular veins in infants. ***B-IV*** (Venkataraman, Thompson, & Orr, 1997; Haas, 2004)

69. Place catheters used for hemodialysis and pheresis in a jugular vein rather than a subclavian vein to avoid venous stenosis if catheter access is needed. Femoral veins could be used if no other access is available. ***B-IV***

Maximal Sterile Barrier Precautions during Catheter Insertion

70. Use aseptic technique including the use of a cap, mask, sterile gown, sterile gloves, and a large sterile sheet, for the insertion of CVCs (including PICCs) or guidewire exchange. *(CDC category IA)* ***A-IV***
71. Use a sterile sleeve to protect pulmonary artery catheters during insertion. *(CDC category IB)* ***A-IV***

Replacement of Catheter

72. Do not routinely replace CVCs, PICCs, hemodialysis catheters, or pulmonary artery catheters to prevent catheter-related infections. *(CDC category IB)* ***A-IV***
73. Do not remove CVCs or PICCs on the basis of fever alone. Use clinical judgment regarding the appropriateness of removing the catheter if infection is evidenced elsewhere or if a noninfectious cause of fever is suspected. *(CDC category II)* ***A-IV***
74. Do not use guidewire exchanges routinely for nontunneled catheters to prevent infection. *(CDC category IB)* ***A-IV***
75. Use a guidewire exchange to replace a malfunctioning nontunneled catheter if no evidence of infection is present. *(CDC category IB)* ***A-IV***
76. Use a new set of sterile gloves before handling the new catheter when guidewire exchanges are performed. *(CDC category II)* ***A-IV***

Catheter and Catheter-Site Care

77. Designate one port exclusively for parenteral nutrition if a multilumen catheter is used to administer parenteral nutrition. *(CDC category II)* ***A-IV***

    There is no recommendation on the need to reserve a port of a multilumen catheter for the future use of parenteral nutrition. ***UI***

78. There is no recommendation on the routine use of antimicrobial agent lock solutions to prevent CABSIs. *(CDC category II)* ***UI*** (Carratala et al., 1999; Onland et al., 2006; Rijnders et al., 2005; Garland et al., 2005; Henrickson et al., 2000; Safdar & Maki, 2006)
    - 78-P**. Evidence is emerging concerning the safety and efficacy of ethanol locks in preventing and treating catheter-related BSIs in certain high-risk pediatric patients requiring long-term IV access (i.e., home parenteral nutrition, oncology, dialysis). Ethanol locks may decrease the need for line removal and eradicate persistent pathogens in catheter-related infections. While no specific recommendation can be made for or against their use at this time due to limited data, the ethanol lock technique is a reasonable alternative when other approaches have been ineffective. ***UI*** (Onland et al., 2006; Dannenberg et al., 2003; Opilla, Kirby, & Edmond, 2007)

79. Replace the catheter-site dressing when it becomes damp, loosened, or soiled or when inspection of the site is necessary. *(CDC category IA)* ***A-IV***
80. Replace dressings used on short-term CVC sites every 48 hours for gauze dressings and at least every 7 days for transparent dressings, except in those pediatric patients in which the risk for dislodging the catheter outweighs the benefit of changing the dressing. *(CDC category IB)* ***A-IV***
81. Replace dressings used on tunneled or implanted CVC sites no more than once per week, until the insertion site has healed. *(CDC category IB)* ***A-IV***
82. No recommendation can be made regarding the necessity for any dressing on well-healed exit sites of long-term cuffed and tunneled CVCs. *(CDC category UI)* ***UI***
83. No recommendation can be made for the use of sutureless securement devices to reduce the incidence of CABSI. *(CDC category UI)* ***UI***
84. Ensure that catheter-site care is compatible with the catheter material. *(CDC category IB)* ***B-IV***
85. Use a sterile sleeve for all pulmonary artery catheters. *(CDC category IB)* ***A-IV***

Additional Recommendations for Peripheral Arterial Catheters and Pressure Monitoring Devices for Adults and Children

Maximal Sterile Barrier Precautions During Catheter Insertion

86. Use aseptic technique including the use of a cap, mask, sterile gown, sterile gloves, and an appropriately sized sterile drape, for the insertion of peripheral arterial catheters. ***A-IV***

Selection of Pressure Monitoring System

87. Use disposable, rather than reusable, transducer assemblies when possible. *(CDC category IB)* ***A-IV***

Replacement of Catheter and Pressure Monitoring System

88. Do not routinely replace peripheral arterial catheters to prevent catheter-related infections. *(CDC category II)* ***A-IV***
89. Replace disposable or reusable transducers at 96-hour intervals. Replace other components of the system (including the tubing, continuous-flush device, and flush solution) at the time the transducer is replaced. *(CDC category IB)* ***A-IV***

Care of Pressure Monitoring Systems

90. Keep all components of the pressure monitoring system (including calibration devices and flush solution) sterile. *(CDC category IA)* ***A-IV***
91. Minimize the number of manipulations of and entries into the pressure monitoring system. Use a closed-flush system (i.e., continuous flush), rather than an open system (i.e., one that requires a syringe and stopcock), to maintain the patency of the pressure monitoring catheters. *(CDC category II)* ***A-IV***
92. When the pressure monitoring system is accessed through a diaphragm rather than a stopcock, wipe the diaphragm with an appropriate antiseptic before accessing the system. *(CDC category IA)* ***A-IV***
93. Do not administer dextrose containing solutions or parenteral nutrition fluids through the pressure monitoring circuit. *(CDC category IA)* ***A-IV***

Sterilization or Disinfection of Pressure Monitoring Systems

94. Use disposable transducers. *(CDC category IB)* ***A-IV***
95. Sterilize reusable transducers according to the manufacturers' instructions if the use of disposable transducers is not feasible. *(CDC category IA)* ***A-IV***

Umbilical Catheters

96. Remove and do not replace umbilical artery or umbilical vein catheters if any signs of CABSI, vascular insufficiency, or thrombosis are present. *(CDC category II)* ***A-IV*** (Nash, 2006; Bradshaw & Furdon, 2006)
97. No recommendation can be made for treating through an umbilical venous catheter suspected of being infected. *(CDC category II)* ***UI*** (Nash, 2006; Bradshaw & Furdon, 2006)
98. Replace umbilical venous catheters only if the catheter malfunctions. *(CDC category II)* ***A-IV*** (Safdar & Maki, 2006; Dannenberg et al., 2003)
99. Cleanse the umbilical insertion site with an antiseptic before catheter insertion. Adverse events in infants have been reported with all

available products (e.g., alcohol, iodine and chlorhexidine) and safety data are limited. Therefore, institutions must weigh risks and benefits of individual products when making their choice of specific antiseptic. Tincture of iodine should be avoided because of the potential effect on neonatal thyroid function. *(CDC category IB)* ***B-III*** (Nash, 2006)

100. Do not use topical antibiotic ointment or creams on umbilical catheter insertion sites because of the potential to promote fungal infections and antimicrobial resistance. *(CDC category II)* ***A-IV***
101. Add low doses of heparin (0.25–1.0 F/mL) to the fluid infused through umbilical arterial catheters. *(CDC category II)* ***A-IV***
102. Remove umbilical catheters as soon as possible when no longer needed or when any sign of vascular insufficiency to the lower extremities is observed. Optimally, umbilical artery catheters should not be left in place >5 days. *(CDC category II)* ***A-IV***
103. Umbilical venous catheters should be removed as soon as possible when no longer needed but can be used up to 14 days if managed aseptically. *(CDC category II)* ***A-IV***

*Identifies evidence from the Centers for Disease Control and Prevention (CDC)'s updated guidelines without repeating the detailed literature review process.

**Pediatric. The Pediatric Affinity Group was charged with reviewing recommendations of the other Task Groups to identify areas where specific modifications were needed to make the statements applicable to neonates, infants and/or children. After a review of the pediatric literature, the group amended the general/adult statements and determined the strength of recommendations. These revisions are designated with the original number of the statement they relate to, followed by P.

***Identifies pediatric statements in which only the adult evidence cited by the source guideline was used.

Definitions:

Level of Evidence Ranking

Level I: Strong evidence from at least one well-designed randomized controlled trial

Level II: Evidence from well-designed non-randomized trials; cohort or case-controlled analytic studies (preferably from >1 center); multiple time-series studies

Level III: Well-designed descriptive studies from more than one center or research group

Level IV: Opinions of authorities (e.g., guidelines), clinical evidence; reports of expert committees

Level V: No quality studies found and no clear guidance from expert committees, authorities or other sources

Strength of Recommendation Ranking

Category A: Strongly recommended

Category B: Recommended for implementation

Category C: Consider for implementation

Category D: Recommended against implementation

Category UI: Unresolved issue

No recommendation: Unresolved issue. Practices for which insufficient evidence or no consensus regarding efficacy exists.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

References open in a new window

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Evidence-based best practice guidelines and interventions for prevention of healthcare-associated infection will promote patient and healthcare worker safety and improve health outcomes by reducing the risk of acquiring and transmitting healthcare associated infections.

POTENTIAL HARMS

- Adverse events in infants have been reported with all available antiseptic products (e.g., alcohol, iodine and chlorhexidine) and safety data are limited.
- The risk and benefits of placing a device at a recommended site to reduce infectious complications should be weighed against the risk for mechanical complications (e.g., pneumothorax, subclavian artery puncture, subclavian vein laceration, subclavian vein stenosis, hemothorax, thrombosis, air embolism, and catheter misplacement).

CONTRAINDICATIONS

CONTRAINDICATIONS

Contraindications to chlorhexidine include allergy and hypersensitivity to the agent.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

The final recommendations contained in *Prevention and Control of Healthcare-Associated Infections in Massachusetts* were adopted by the Betsy Lehman Center for Patient Safety and Medical Error Reduction (BLC) and the Massachusetts Department of Public Health (MDPH). MDPH incorporated the recommendations into the reporting requirements, and developed an assessment tool for surveyors to use to evaluate the implementation of best practices.

IMPLEMENTATION TOOLS

Staff Training/Competency Material

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
Staying Healthy

IOM DOMAIN

Effectiveness
Safety

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Prevention of bloodstream infections. In: Betsy Lehman Center for Patient Safety and Medical Error Reduction, JSI Research and Training Institute, Inc. Prevention and control of healthcare-associated infections in Massachusetts. Part 1: final recommendations of the Expert Panel. Boston (MA): Massachusetts Department of Public Health; 2008 Jan 31. p. 69-82.

ADAPTATION

The guideline was adapted from: O'Grady, N. P., M. Alexander, et al. (2002). Guidelines for the prevention of intravascular catheter-related infections. Centers for Disease Control and Prevention. MMWR Recomm Rep 51(RR-10): 1-29.

DATE RELEASED

2008 Jan 31

GUIDELINE DEVELOPER(S)

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Massachusetts Department of Public Health - State/Local Government Agency [U.S.]

SOURCE(S) OF FUNDING

Massachusetts Department of Public Health

GUIDELINE COMMITTEE

Massachusetts Healthcare-Associated Infections Expert Panel

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the Massachusetts Department of Public Health Web site.

AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Betsy Lehman Center for Patient Safety and Medical Error Reduction, JSI Research and Training Institute, Inc. Prevention and control of healthcare-associated infections in Massachusetts. Part 2: findings from complementary research activities. Boston (MA): Massachusetts Department of Public Health; 2008 Jan 31. 131 p. Available in Portable Document Format (PDF) from the Massachusetts Department of Public Health Web site.
- Handwashing education materials for health care professionals. Available from the Massachusetts Department of Public Health Web site.

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI Institute on October 17, 2008. The information was verified by the guideline developer on December 22, 2009.

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